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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/649,058	08/27/2003	Gurtej S. Sandhu	MICS:0099	4945

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Michael G. Fletcher
Fletcher Yoder
P.O. Box 692289
Houston, TX 77269-2289

EXAMINER

PHAM, LONG

ART UNIT PAPER NUMBER

2814

DATE MAILED: 07/12/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/649,058

Applicant(s)

SANDHU, GURTEJ S.

Examiner

Long Pham

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-10 and 26-35 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-10 and 26-35 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____ | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION

Drawings

1. The drawings were received on 05/02/05. These drawings are approved.

Rejections and/or objections necessitated by the amendments

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al. (US 5,714,766) in combination with Trent et al. (US publication 2005/0130258) and Gambino et al. (US patent 6,361,863).

With respect to claim 1, Chen et al. teach a vertical tunneling transistor, comprising (see fig. 6 and associated text):
a channel 26 disposed on a substrate 20;
a quantum dot 34,34', or 34" disposed so that the channel is between the quantum dot and the substrate;
a gate 16 is disposed so that the quantum dot is between the gate and the channel; and
wherein an axis through the channel, quantum dot, and the gate is substantially perpendicular to an upper surface of the substrate.
Further with respect to claim 1, Chen et al. fail to teach that the quantum dot comprises of platinum.

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Trent et al. teach quantum dot made of platinum. See claims 24 and 51.

It would have been obvious to one of ordinary skill in the art of making semiconductor devices to use quantum dot made of platinum in the device of Chen et al. to obtain devices having nanostructures. See [0013].

With respect to claim 2, Chen et al. further teach a source 18 disposed on the substrate adjacent to the channel. See fig. 6 and associated text.

With respect to claim 3, Chen et al. further teach a drain 14 disposed on the substrate adjacent to the channel. See fig. 6 and associated text.

With respect to claim 4, Chen et al. further teach a tunneling barrier 30, 30', or 30" disposed between the channel and the quantum dot. See fig. 6 and associated text.

Further with respect to claim 4, Chen et al. fail to teach that the tunneling barrier is made of hafnium oxide.

Gambino et al. teach using hafnium oxide as tunneling barrier material. See col. 3, lines 55-65.

It would have been obvious to one of ordinary skill in the art of making semiconductor devices to incorporate the above teaching of Gambino et al. into the device of Chen et al. to provide suitable tunneling barrier effect. See col. 3, lines 55-65.

With respect to claim 5, Chen et al. further teach an insulative layer 38 disposed between the quantum dot and the gate. See fig. 6 and associated text.

1. Claims 26, 27, 28, 29, 30, 31, 32, 33, 34, and 35 rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al. (US 5,714,766) in combination with Trent et al. (US publication 2005/0130258) and Gambino et al. (US patent 6,361,863).

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With respect to claim 26, Chen et al. teach a vertical tunneling transistor, comprising (see fig. 6 and associated text):
a channel 26 disposed on a substrate 20;
a quantum dot 34,34', or 34'' disposed so that an axis through the channel and the quantum dot is substantially perpendicular to the substrate; and
a gate 16 is disposed so that an axis through the channel, the quantum dot, and the gate is substantially perpendicular to the substrate.

With respect to claims 27, 28, 29, 33, and 35, it is noted that the recited process limitations are not given weight in the patentability determination of present device claims.

With respect to claim 30, Chen et al. further teach a source 18 disposed adjacent to the channel. See fig. 6 and associated text.

With respect to claim 31, Chen et al. further teach a drain 14 disposed adjacent to the channel. See fig. 6 and associated text.

With respect to claim 32, Chen et al. further teach a tunneling barrier 30,30',30''. See fig. 6 and associated text.

With respect to claim 34, Chen et al. further teach an insulative layer 38. See fig. 6 and associated text.

Further with respect to claim 26, Chen et al. fail to teach that the quantum dot comprises of platinum.

Trent et al. teach quantum dot made of platinum. See claims 24 and 51.

It would have been obvious to one of ordinary skill in the art of making semiconductor devices to use quantum dot made of platinum in the device of Chen et al. to obtain devices having nanostructures. See [0013].

Further with respect to claim 32, Chen et al. fail to teach that the tunneling barrier is made of hafnium oxide.

Gambino et al. teach using hafnium oxide as tunneling barrier material. See col. 3, lines 55-65.

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It would have been obvious to one of ordinary skill in the art of making semiconductor devices to incorporate the above teaching of Gambino et al. into the device of Chen et al. to provide suitable tunneling barrier effect. See col. 3, lines 55-65.

2. Claims 6-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mullarkey (US 2002/0021158) in combination with Chen et al. (US 5,714,766) and Gambino et al. (US patent 6,361,863).

With respect to claim 6, Mullarkey teaches an integrated circuit device, comprising (see [0007]):

a substrate or wafer 10;

a memory array that includes a plurality memory cells disposed on the substrate, each of the plurality of memory cells comprising a memory element and an access transistor.

However, Mullarkey fails teach that the access transistor is a transistor as recited in present claims 6-10.

Chen et al. teach a transistor as recited in present claims 6-10. See the above rejection.

It would have been obvious to one of ordinary skill in the art of making semiconductor devices to use the transistor as taught in Chen et al. in the device of Mullarkey because the transistor of Chen et al. allows storage of multi-bit word. See col. 2, lines 35-38 of Chen et al.

Further with respect to claim 6, Chen et al. fail to teach that the quantum dot comprises of platinum.

Trent et al. teach quantum dot made of platinum. See claims 24 and 51.

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It would have been obvious to one of ordinary skill in the art of making semiconductor devices to use quantum dot made of platinum in the device of Chen et al. to obtain devices having nanostructures. See [0013].

Further with respect to claim 9, Chen et al. fail to teach that the tunneling barrier is made of hafnium oxide.

Gambino et al. teach using hafnium oxide as tunneling barrier material. See col. 3, lines 55-65.

It would have been obvious to one of ordinary skill in the art of making semiconductor devices to incorporate the above teaching of Gambino et al. into the device of Chen et al. to provide suitable tunneling barrier effect. See col. 3, lines 55-65.

Conclusion

3. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Long Pham whose telephone number is 571-272-1714. The examiner can normally be reached on M-F, 7:30AM-3:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on 571-272-1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Long Pham
Primary Examiner
Art Unit 2814

LP